

CUMULATED INTERNAL DOSE OF METALS AND PULMONARY FUNCTION AMONG METAL EXPOSED WORKERS

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Background: Inhalation of metals might be toxic to the respiratory system. Metal/chemical industries are important sources of exposure to metals via direct inhalation to the lungs. We studied the relationship between cumulative internal dose of metals and pulmonary function (spirometry) among a group of workers exposed to metals.

Methods: We obtained results of toenails metal levels and spirometry in 55 volunteer workers from the chemical/metal industry and 42 unexposed service workers. Forced vital capacity (FVC), forced expiratory volume in one second (FEV1), peak expiratory flow (PEF), and forced expiratory flow at 25-75% of forced vital capacity (FEF25-75) were measured with a portable spirometer. Toenail metal levels were measured by multielemental analysis with emission spectroscopy by ICP-MS. Comparison of the median of metal levels between two categories of qualitative variables was tested using by the U Mann-Whitney test. The correlation between each metal and the spirometry parameters was estimated with the Spearman's rho.

Results: Molybdenum levels correlated inversely with the percentages of VEF1 ($p=0.015$), PEF ($p=0.009$), FEF25-75 ($p=0.008$), and the FEV1/FVC ratio ($p=0.032$). Vanadium levels correlated inversely with the percentages of PEF ($p=0.001$), and FEF25-75 ($p=0.019$), and with the FEV1/FVC ratio ($p=0.019$); while manganese also correlated inversely with the percentage of PEF ($p=0.039$). Cumulative internal dose of vanadium were associated with the presence of an obstructive pattern ($p=0.002$), with a FEV1 percentage lower than 80% ($p=0.008$), with a FEV1/FVC ratio lower than 70% ($p=0.0001$), and with a percentage of FEF25-75 lower than 60% ($p=0.011$). Similar associations were observed for manganese, molybdenum and cobalt. Chromium levels were associated to a lesser extend with the same parameters, and resulted also associated with the lack of presence of a restrictive pattern ($p=0.048$).

Conclusions: We observed individual associations between the cumulative internal dose of vanadium, molybdenum, manganese, cadmium, lead and cobalt, and pulmonary function.